World leader in the science of quality for infectious disease testing

NRL
Science of Quality

YEAR 2023-2024

Our Story: Leading Diagnostic Quality

For over 40 years, the National Serology Reference Laboratory, Australia (NRL) has proudly led the charge in raising the global standard of diagnostic excellence in testing for infectious diseases. As an operating division of St Vincent's Institute of Medical Research (SVI) in Australia, NRL is dedicated to supporting laboratories worldwide in achieving reliable and accurate diagnostic outcomes. Recognised as a World Health Organisation (WHO) Collaborating Centre for Diagnostics and Laboratory Support for HIV/AIDS and Other Blood-borne Infections (AUS-45) since October 1985, we provide invaluable expertise in laboratory quality assurance, policy development, and advanced testing strategies, particularly in combating infectious diseases like HIV, hepatitis, and SARS-CoV-2.

NRL's approach is grounded in scientific innovation and collaborative solutions. Our QConnect™ concept has revolutionised quality control for infectious disease testing by enabling laboratories to monitor testing reliability through data-driven insights and real-time, peer-reviewed informatics. Coupled with ISO-accredited products and services, including bespoke quality assurance programs, pre- and post-market test kit evaluations, and specialised biobanking solutions, we are committed to empowering laboratories to continually improve diagnostic care. Our quality assurance solutions for Point-of-Care Testing (PoCT) in a community setting ensure that quality diagnostic outcomes can also be achieved in primary and community-based care, in Australia and across the world.

In times of crisis, such as the COVID-19 pandemic, NRL demonstrated leadership by pioneering new testing protocols, establishing a world-class biorepository of SARS-CoV-2 samples, and partnering with prominent institutions to develop and evaluate diagnostic tools. These efforts contributed to strengthening global responses to the pandemic, reflecting our mission to improve the quality of testing for infectious diseases.

At NRL, we understand that accurate and timely diagnosis leads to better health outcomes, for the individual and to community. By fostering innovation, upholding the highest quality standards, and nurturing partnerships across the globe, we continue to shape a future where accurate and accessible testing empowers communities to thrive.

LEARN MORE

Contents

NRL acknowledges the Wurundjeri people and the people of the Kulin Nation as the Traditional Owners of the land on which we work. We pay respect to their Elders, past and present.

Directors Report

The 2023-24 year was one in which NRL's science, and its scientists have continued to make a difference globally. This report presents the highlights and impact of collective efforts across the range of boutique and complementary scientific services NRL provides. We continue to be a global leader in the science of quality for infectious disease testing, as we strive to ensure the highest standards in every aspect of our work. Our commitment to scientific excellence is evident in the range of quality accreditations, certifications and licenses we maintain across our portfolio of scientific services.

We welcomed working with the Australian Society for Microbiology (ASM) in early 2024 to make recommendations to ASM members and NATA (National Association of Testing Authorities) highlighting key factors to be addressed when implementing external quality control processes for infectious disease testing. The recommendations represent best practice for qualitative testing, and we encourage laboratories to review and ensure these principles are applied in the laboratory, rather than approaches designed for quantitative testing, which are not fit for all purposes.

Our innovative quality assurance (QA) programs for PoCT in a community-based or primary care setting commenced transitioning from being a project-based solution to readily available products during this reporting period. Our approach has highlighted the critical importance of providing effective quality assurance principles that are fit-for-purpose and giving immediate feedback on quality assurance results to PoCT users in a community setting. It also demonstrated the ongoing benefit of monitoring of the quality and effectiveness of PoCT when routinely performed outside a laboratory- especially in those countries without a stringent regulatory framework for test kit evaluation. The findings of the original project were startling – up to **60% error rate** for COVID-19 rapid antigen tests in the pilot sites.

We were delighted to be re-designated by WHO as a Pre-qualification Evaluation Laboratory (PEL) – the only Australian laboratory and one of only fifteen globally. NRL staff have contributed strongly by supporting WHO Geneva with a range of special projects throughout the year and attendance at the PEL meeting in Geneva in May.

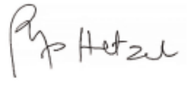
The SVI Biobank which NRL hosts and delivers on behalf of SVI has continued to grow in its offering of validated sample processing services to clinical researchers on the St Vincent's Hospital Melbourne campus and beyond. We maintain a strong focus on quality and in June 2024 following an advisory visit from NATA, we were assessed as being ready for accreditation under ISO 20387. We plan to achieve this milestone in early 2025 and, when successful, will be the second biobanking service in Australia to do so.

Patient sample testing, using the NRL's in-house, quantitative HTLV pro-viral load assay, was completed for the HTLV1 Longitudinal Study in Central Australia with the data being presented at the IUSTI Congress in Sydney. We continue to collaborate with the National Aboriginal Controlled Congress of Health Organisations (NACCHO) by providing advice, supporting the development of clinical guidelines for use in primary care in Central Australia and also supporting NACCHO's HTLV-1 research agenda.

Our focus to improve access to, and the quality of, molecular HTLV-1 testing services globally has included support for WHO to develop HTLV clinical guidelines, presentation at public health workshops in June and provision of secretariat support and leadership of the International Retrovirology Association's (IRVA) International HTLV-1 Working Group. The Testing Working Group has representation from ten laboratories across six countries who are collaborating and sharing expertise, knowledge and testing protocols to enable laboratories without capability to develop and provide their own quality testing services locally. Following the HTLV 2024 Conference in June, a further testing subgroup is being established to develop guidance on prognostic biomarkers for HTLV-1 associated conditions including Adult T-Cell leukaemia/ lymphoma and HAM / TSP. These international collaborative efforts are vital to strengthen sustainable capability and share knowledge and expertise at a time when HTLV has often been neglected, the prevalence is often unknown, and many countries have no public health strategies in place.

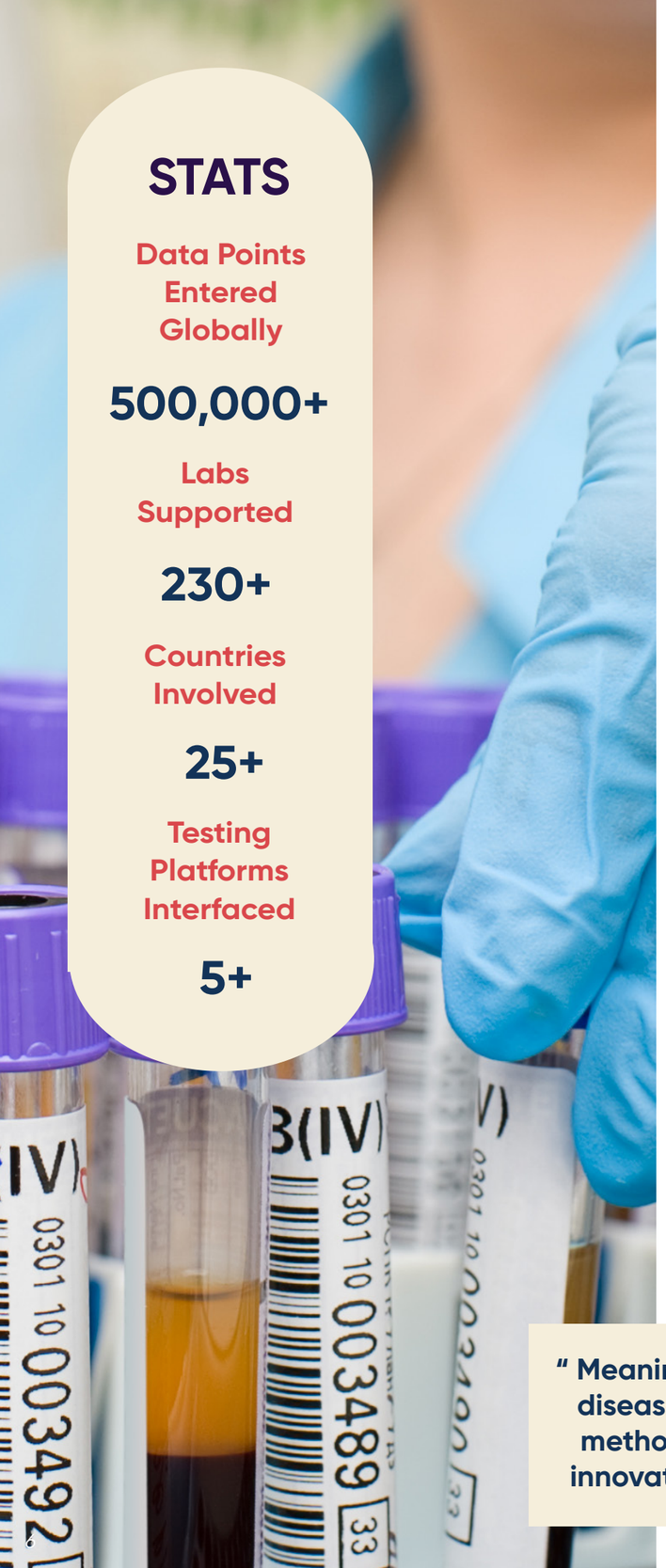
Our Scientific Training and Consulting team have been in high demand this year and received very high commendations for their professionalism, customised approach to laboratory assessment, effective delivery of wet workshops, personalised mentoring and ongoing virtual support for sustainable outcomes. The relationships we establish through our work are meaningful and emphasise the ongoing benefits of continuous improvement. Our laboratory capacity building efforts this year included hosting webinars in partnership with WHO SEARO and WPRO, with activities in Sri-Lanka, Indonesia, Cambodia, Laos, PNG and Mongolia. We conducted a gap analysis of access to laboratory services at the primary healthcare level across the Western Pacific region and capacity building programs in India, Indonesia and the Democratic Republic of Congo to enable delivery of their own EQAS programs to other laboratories.

For the small size of the NRL division, I am always delighted and proud when we communicate the impact of achievements made each year. The commitment and expertise of NRL staff is to be commended and I thank them all for their scientific excellence, hard work, energy and innovation. I would also like to thank our many partners, collaborators, customers and funders. Your support and loyalty are greatly appreciated.



Dr Philippa AS Hetzel

NRL Director



STATS

Data Points Entered Globally

500,000+

Labs Supported

230+

Countries Involved

25+

Testing Platforms Interfaced

5+

Quality Control: Bringing Meaningful QC to the Laboratory

NRL has continued to make great strides in helping laboratories realise that without **'Meaningful QC'**, there is no context being provided around QC data for infectious disease testing. More and more laboratories are adopting the QConnect concept, with NRL's international QC distribution partners actively promoting the science of QC for infectious disease testing. This past year has seen excellent uptake of the QConnect concept by blood screening and clinical laboratories around the world. In some countries, such as the UK and Colombia, the uptake of the **QConnect concept is now a movement.** Regulators are writing the QConnect approach into guidelines and requirements.

A key part of this success is due to **EDCNet™** – a world-leading QC software solution that fully adopts and integrates the QConnect concept, where traditional Westgard rules are replaced by a comprehensive and sophisticated graphing option. NRL is continually improving EDCNet to complement the increasing portfolio of QC products supported by NRL, as well as remaining flexible for its users – the laboratories. EDCNet software is a fully integrated solution, over five testing platforms have now been interfaced. With an expansion of testing types introduced in EDCNet, users can migrate other testing and associated QC samples to the system as well.

NRL QC Services has helped many laboratories understand that traditional practices – using an unsuitable QC monitoring system, invariably necessitates unnecessary re-testing of QC samples, calibration and recalibration of QC ranges. This approach adds to laboratory costs and does little to improve quality. Without context, re-establishing ranges ignores observed bias and runs the risk of missing variation of genuine concern. NRL's QConnect, which is **10 years old in 2025**, uses historical data to establish expected limits and it is this context that provides Meaningful QC. It is noteworthy that NRL's QC program doesn't just provide QC samples and software. The NRL QC Services team actively and routinely review QC data that is outside NRL's expected limits, conducts investigations and proactively contacts laboratories, test kit manufacturers and our QC partner to troubleshoot. NRL QC Services publishes their findings on the NRL and EDCNet websites. Where necessary and appropriate, NRL reports these findings to regulators, conducts complex scientific investigations in collaboration with test kit manufactures to identify and rectify the root cause. NRL staff also conduct many training sessions throughout to the year to customers and QC partners.

" Meaningful QC gives context to infectious disease testing, transforming traditional methods into impactful science through innovations like QConnect and EDCNet. "

No other QC provider facilitates such personalised, scientific services.

IMPACT

In early 2024, Dr Wayne Dimech and Joe Vincini, worked with Belinda McEwan representing Australian Society for Microbiology (ASM), to make a recommendation to members and to NATA highlighting key factors important to monitoring external quality control processes for infectious disease testing.

These recommendations included the following statements:

- Controls provided by the manufacturer (kit controls) must be used if the manufacturer's instructions for use (IFU) state that their use is required.
- If the use of kit controls is not required by the manufacturer's IFU, then a laboratory must use either kit controls and/or a third-party external quality control (EQC) to validate the test each day the test is used.
- Use of both kit controls and EQC is recommended. Where suitable EQC specimens are available, their use in maintaining QC is recommended.
- If the laboratory uses the kit controls to validate the test, they must use the validation rules specified by the manufacturer.
- If the laboratory uses EQCs to validate the test, the EQC and acceptance limits must be validated by the laboratory for use on that test.
- The laboratory must have a documented method for establishing acceptance criteria for an EQC based on scientific evidence that is validated for use in infectious disease testing.
- The laboratory must have documented procedure for when the controls are outside the established acceptance criteria.

When adopted, scientists responsible for infectious disease testing will demonstrate best practice for qualitative testing rather than applying a model that was historically designed for quantitative clinical chemistry testing and used because there was no alternative.

HIGHLIGHTS

In 2023/2024, **NRL introduced new QC products to the ANZ catalogue:**

Two molecular QC products were released - **Optitrol™ NAT HAV** and **Optitrol™ NAT Parvo B19.** These two products are critical in the monitoring HAV and Parvo B19 testing of donations intended to be used as plasma for fractionation.

The NRL catalogue of products continued to expand, due to a program of development work underway with our manufacturer **DiaMex GmbH** (Heidelberg, Germany). There are more exciting products in the pipeline planned for early 2025.

We remain committed to providing and improving support forQConnect customers through collaboration between NRL, DiaMex and our international QC distribution partners conducting training seminars for customers and ongoing interactive support for technical matters.

LEARN MORE

" NRL EQAS ensures testing integrity with scientific excellence, real-world accuracy, and cost-effective solutions."

LEARN MORE

STATS

NAT Panels Sent

1226

SER TE1 Panels Sent

1492

SER TE2 Panels Sent

1596

SER TE3 Panels Sent

1573

EQAS: Science Architect

NRL External Quality Assessment Schemes (EQAS), also known as Proficiency Testing, are designed to assess the integrity of tests and testing processes.

NRL is the leader in EQAS solutions for infectious disease, with syndromic programs which typically reflect a range of analytes as requested by physicians.

NRL EQAS are designed to assess the integrity of the entire laboratory testing process for infectious disease markers from sample receipt through to interpretation and reporting of patient test results. The design and analysis of NRL EQAS draws upon NRL's extensive experience and scientific methods to ensure maximum scope for error detection.

NRL EQAS panels consist of a combination of positive and negative samples representative of those typically received by a testing laboratory. NRL analyses and reports participants' results online via OASYS – an internet-based application owned and managed by our partner Oneworld Accuracy (Vancouver, Canada).

NRL is a fully accredited ISO 17043 provider and our EQAS features include:

SYNDROMIC PANELS

Doctors rarely request testing for individual analytes. Patient samples are tested for a range of analytes associated with a clinical syndrome.

MULTI ANALYTE PROGRAMS

NRL's three clinical serology programs cover **over 28 different analytes.** NRL offers comprehensive multimarker molecular programs which are suitable for multiplex, single analyte and Point of Care assays.

EASY MANAGEMENT

NRL EQAS **Test Event dates are now streamlined,** such that all programs share the same Test Event dates, assisting laboratories to effectively schedule the testing, result submission and review of EQAS reports and reducing the time and effort required by a laboratory.

COST EFFECTIVE

Syndromic panels are cheaper compared with single analyte programs as laboratories can test for multiple analytes within the program. This makes EQAS **more affordable** to laboratories, especially those in low- and middle-income countries.

INFORMATICS

NRL EQAS reports has personalised comments, graphical results and an international peer group, enabled through the **OASYS software**. NRL EQAS staff review all results and pro-vide individualised feed-back to participants. Multiple reports including laboratory-specific reports and statistics across the whole of the program are provided each test event, allowing participants to review their own results and compare with other laboratories within our global network.

SCIENTIFIC EXCELLENCE

NRL endeavours to provide **real clinical samples** for all EQAS test events. The evaluation of results is based on known reference results, while peer group performance is also assessed.

HIGHLIGHTS

Test Event Date Streamlining

In order to simplify the EQAS Processes, from 2024, the Test Event dates for all Serology, Molecular, POC & Specialised programs **follow the same schedule.**

Improved Evaluation Criteria of Viral Load Results

NRL EQAS continues to improve the criteria of viral load results assessment. One of the improvements introduced in 2024 was to **evaluate the viral load results from small peer groups.** When the number of viral load results received from a peer group is less than five (n<5), the results are now evaluated according to the improved evaluation criteria when possible.

Introduction of new EQAS for Molecular Testing of Transplant-Transmitted Infections

This program, **Transplant-Transmitted Infections Molecular (TTIM435)** was introduced for EQAS 2024. This program is designed for laboratories that monitor post-transplantation infections and laboratories that perform qualitative and/or quantitative molecular testing of **EBV, BKV, JCV and HHV6.**

Participation in EQAS is compulsory in many jurisdictions and is vital in assessing the integrity of the entire infectious disease testing process.

STATS

Reached in FIND SARS-CoV-2 Antigen Study

120 Sites, 8 Countries

First Nations communities reached in HCV Program

95

Healthcare Labs supported in AIHSP Project

19

" NRL's PoCT QA model ensures reliable testing in remote settings, empowering healthcare workers to serve underserved communities with accuracy and confidence. "

Point of Care QA:
Accuracy Where it Matters

Since 2022, NRL has advanced a tailored approach to ensure quality infectious disease testing in remote or resource-limited settings, particularly through point-of-care testing (PoCT). PoCT decentralises diagnostics, enabling healthcare workers to reach underserved populations, including remote areas, prisons, and marginalised groups. The COVID-19 pandemic accelerated the adoption of rapid and self-testing, reducing barriers to STI testing among women and supporting immediate diagnosis, treatment, and counselling.

However, PoCT faces challenges like manufacturing, transport, storage, and misuse, which can compromise accuracy and lead to inappropriate treatment, infection spread, and stigma. Quality Assurance (QA) is vital but faces barriers like high costs, logistical challenges, and limited awareness outside laboratories.

NRL'S PoCT QA MODEL

In collaboration with **WHO and FIND**, NRL developed a QA model to address these challenges:

Ambient-Stable Samples: Room-temperature stable samples reduce shipping costs and eliminate import permits.

Local Hubs: Partnerships with local organisations ensure efficient distribution.

Integrated Logistics: Combining sample shipments with test reagents lowers costs.

PoCT QA PROGRAMS

NRL's QA programs include:

- **Competency Panels:** Known positive and negative samples.
- **External Quality Assessment (EQA):** Five samples distributed over time with unique codes for verification.

Participants receive immediate feedback and periodic reports, reducing costs and logistics.

EDCNET™ SOFTWARE UPGRADE

In partnership with **The Ashvins Group,** NRL enhanced its quality control software, **EDCNet™,** with features like:

- Data entry for competency and EQA panels.
- Support for qualitative and quantitative data.
- QR codes for smartphone data entry and instant feedback.

SUPPORTED PoCT QA PROGRAMS

FIND SARS-CoV-2 Antigen Study:

Since 2022, NRL has led a FIND-funded project as part of the WHO COVID-19 Tools Accelerator program, testing SARS-CoV-2 rapid antigen tests (COVID RDTs) at **120 sites across 8 countries** in Africa, Asia, and the Pacific. NRL developed and validated SARS-CoV-2 sample types, shipped materials, and provided virtual training to participating sites *(Figure 1)*.

While early analysis of QR code data highlighted challenges such as mobile data costs, connectivity, and infrastructure, this reporting method was far superior to reporting by manual coding and provided immediate feedback to the tester. *(Figure 2)*.

National HCV Program:

In collaboration with the Kirby Institute, Flinders University, and funded by the Australian Government, the **National HCV program** provides hepatitis C viral load testing to **95 remote First Nations communities** using the Cepheid GeneXpert HCV FS assay. NRL ensures quality assurance with validated whole blood samples.

MRFF RART Project:

NRL supports the MRFF RART grant lead by **Kirby Institute** by developing samples for use in PoCT for **Human Papilloma Virus (HPV), as well as Group A streptococcus**. The project plan is being finalised and the work on the development of these services is in progress.

Serology Testing in Indonesia:

In 2024, funded by the Australia-Indonesia Health Security Partnership **(AIHSP),** NRL supported **19 Indonesian Primary Healthcare laboratories** (Puskesmas) by providing PoCT QA for **HIV, Hepatitis B and C, and Syphilis serology.**

Locally manufactured rapid diagnostic tests were monitored with QA samples, enabling the Ministry of Health and stakeholders to **identify challenges and improve strategies.** NRL's PoCT QA competency panels enhanced staff proficiency, boosting confidence in test reliability and benefiting laboratories, users, and local manufacturers.

FURTHER DEVELOPMENT

NRL staff are advancing PoCT QA by developing new products and transitioning operations from R&D to market ready products. Notably, malaria testing products have been introduced. From 2025, PoCT QA will be managed by the NRL EQAS and QC Services teams.

Figure 2. *Comparison of manual data reporting vs data submitted by QR code.*

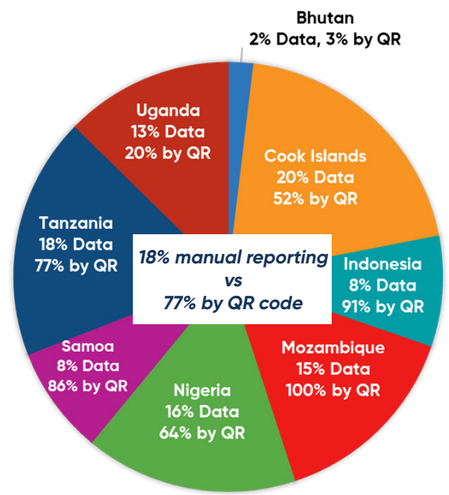


Figure 1. *Countries involved in FIND SARS-CoV-2 Antigen Study.*

Evaluations: World Class Assessments

Independent assessment of in-vitro diagnostic devices (IVDs) and provision of customised validation and verification panels, data analysis and reporting.

NRL specialises in assessing the analytical and clinical performance of IVDs that detect infectious diseases to ensure they meet their stated intended use and conform to key performance, quality and safety criteria. A well-designed, laboratory-based assessment of IVD performance can provide a realistic expectation of how the IVD will perform relevant to local conditions using samples representative of the local population.

NRL is **one of fifteen Performance Evaluation Laboratories (PEL)** designated by WHO for conducting performance evaluation for one or several types of IVDs. WHO Pre-qualification aims to ensure IVDs for supply to low-income countries are quality-assured, safe, effective and accessible. NRL also conducts IVD evaluations on behalf of other regulatory bodies, IVD manufacturers, and non-government agencies.

NRL Evaluations provides drafting of evaluation, validation and verification protocols, customised panels comprised of well characterised samples for use in assay verifications or validations and data analysis.

HIGHLIGHTS

- NRL was redesignated as a Performance Evaluation Laboratory (PEL) in June 2024.
- NRL staff participated in the **2024 WHO PEL meeting** in Geneva in May 2024.
- NRL staff were **appointed to the Evaluation and Expert Advice Panel** established by the Therapeutic Goods Administration to support them with IVD registrations, evaluations and assessments.

SERVICES DELIVERED

- Laboratory Performance Evaluations of HCV Serology Assay for WHO Prequalification
- Laboratory verification and comparison of 16 SARS-CoV-2 Rapid Antigen Tests (RAT's) for a collaborative study between WHO, FIND, PATH and NRL
- Laboratory Verification of a SARS-CoV-2 RAT Kit for an International Department of Health
- Protocol development for sampling and batch testing of HIV Rapid Diagnostic Test Kits (RDT) for Global Fund in the Democratic Republic of Congo
- Development of protocols for the WHO prequalification of SARS-CoV-2 rapid antigen and molecular tests. Provide ongoing advice to WHO Prequalification in developing evaluation protocols
- Several test performance studies on behalf of test kit manufacturers including usability studies and optimisation studies.

LEARN MORE

SUMMARY

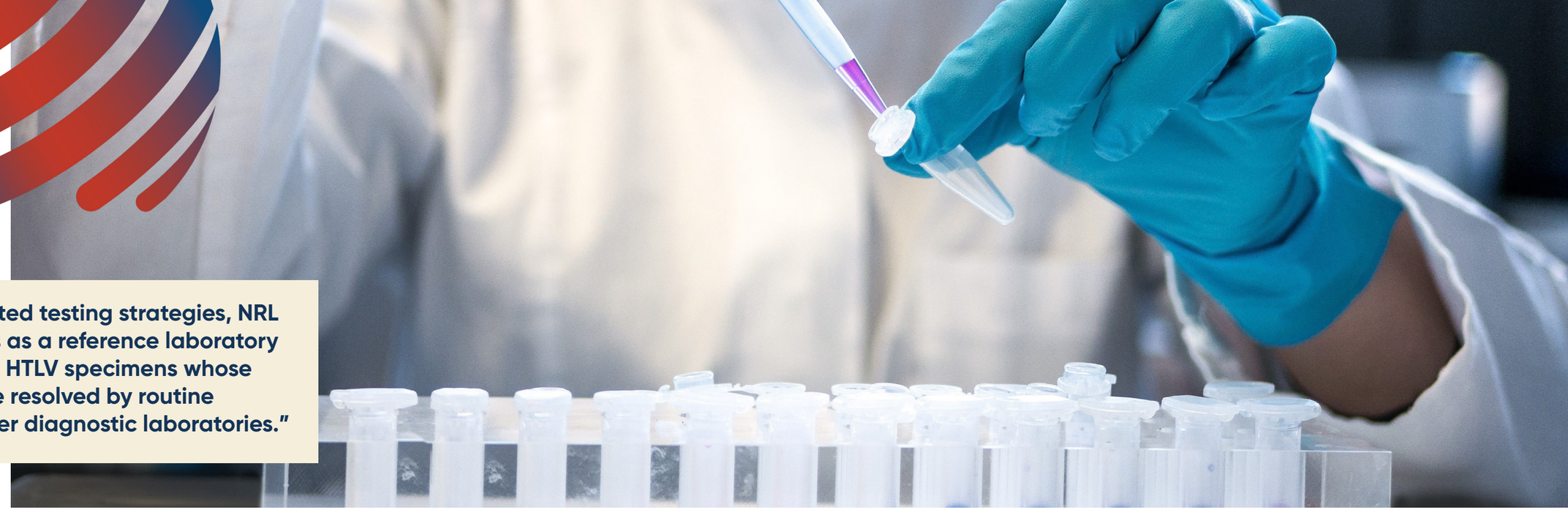
16 SARS-CoV-2 RATs verified in a global study.

1 HCV molecular assay evaluated for WHO Prequalification.

1 SARS-CoV-2 RAT verified for an International DOH.

1 Protocol Developed for HIV RDT testing in DRC.

" Pre-market evaluations of new IVD's are vital in ensuring new diagnostic products are accurate and fit for use. Quite literally, patient's lives depend on the accuracy of the results derived from these IVD's. "



“ Utilising validated testing strategies, NRL Testing operates as a reference laboratory for HIV, HCV and HTLV specimens whose status cannot be resolved by routine screening or other diagnostic laboratories.”

Testing Services: Precision in Every Test

STATS

Donor Screening Tests

8205

HIV/HTLV Confirmatory Tests

1775

The NRL Testing Service offers a range of specialised testing services including **TGA- licensed blood and tissue donor screening for HIV, HCV, HBV, HTLV and Syphilis** for specimens collected from both living and cadaver donors.

NRL Testing also operates as a **reference laboratory** for testing HIV and HTLV specimens whose status cannot be resolved via routine screening by other diagnostic laboratories using validated testing algorithms.

Specialised testing services include where IVDs are not validated for alternative specimen types and **TGA-licenced testing** of specimens for use in certain serology and molecular IVDs under the TGA Authorised Prescriber Scheme. NRL Testing additionally provides **contract testing** for scientific projects in collaboration with other organisations for a range of services that includes, but not limited to:

- Validation of testing algorithms
- Testing support for clinical trials
- Stability studies (Accelerated and Long-term stability)
- Prevalence studies

We provide **batch-release testing** of HIV and Syphilis rapid IVDs for Victorian point-of-care testing sites. Batch release testing involves testing of new batches of IVDs to confirm that their performance is consistent from batch to batch.

HIGHLIGHTS

Over the past year NRL Testing has successfully provided assistance and technical expertise on a number of projects by testing samples referred to NRL for analysis. These projects include:

1. Clinical validation of the Roche cobas HPV test on the Roche cobas 6800 system for the purpose of cervical screening and qualification as a second-generation comparator test

Director Molecular Microbiology, Cervical Cancer Prevention Australia A/Prof David Hawkes, sought to provide testing support for MaRVE study assessing the performance of the cobas HPV test on thecobas 6800 system. For inter-laboratory reproducibility, a set of **550 cervical samples** were tested at NRL using the cobas 6800 system.

2. Blood donor Hepatitis B core total antibody prevalence research study for Lifeblood

A total of **160 samples** collected from blood donors at Lifeblood were tested for Hepatitis B core total antibody using the Liaison XL Instrument at NRL over a period of 10 months.

3. iStatis Hep-B Surface Antigen confirmatory test- clinical trial study for BioLytical Laboratories

BioLytical requested additional testing for the HBsAg lateral flow clinical study they are undertaking with St. Vincent’s Hospital, Melbourne Department of Gastroenterology. The Testing Laboratory at NRL received **175 samples** and tested them for Hepatitis B surface antigen confirmation using the Liaison XL instrument. The project was completed in July 2024.

Change of supervising pathologist at NRL

Dr Chuan Kok Lim, Director, and Dr Eloise Williams, Clinical Microbiologist, at the Victorian Infectious Diseases Reference Laboratory (VIDRL) have been appointed as NRL Honorary Consultants to provide oversight of pathology, supervision and Clinical Governance for Testing Services.

LEARN MORE

SUMMARY

1 5-Year Longitudinal Study Complete

2 Our confirmatory assay for HTLV exhibits high sensitivity, accuracy, precision and clinical relevance.

3 NRL's PSCs enable effective HTLV testing access for remote regions globally.

4 Expanding diagnostic testing capabilities for Hepatitis C and Syphilis.

Research & Development: Innovating Detection, Improving Outcomes

Organisations enabling research translation are uncommon in academia because we focus on the "Development" aspects of R&D rather than breakthrough or discovery research. Our development work has the potential to impact lives today, rather than a potential future date. The NRL's ability to focus on the Development aspects of translational research arises from our mature Quality Management System and our considerable expertise in regulatory affairs from many years of collaboration with Australia's Therapeutic Goods Administration and other regulatory bodies. Our R&D team can assist in the formal design of new IVDs and expedite the translation of existing design concepts into commercially ready products and services. This can include external support in the verification and validation of new IVDs as well as laboratory support for clinical trials. NRL's R&D team is a stand-alone department that also supports research and development activities across NRL's various departments. We actively perform novel development work on IVDs to improve their quality and accessibility for regional, rural and remote areas.

PIONEERING ADVANCES IN HTLV ASSAY DEVELOPMENT

As part of the **ACH4 grant** awarded for the 2023-2024 period, the NRL R&D team has made significant strides in the development of a novel **confirmatory assay for Human T-Lymphotropic Virus (HTLV).**

This assay is specifically designed to distinguish between the **HTLV-1c subtype, HTLV-1 non-C subtypes, and HTLV-2.**

" We are advancing HTLV diagnostics, collaborating globally, and enhancing testing accessibility, with a focus on remote populations and infectious diseases. "

This assay is particularly noteworthy as it is the first of its kind to effectively differentiate between HTLV-1 subtypes and HTLV-2 while simultaneously quantifying the proviral load of HTLV-1c. The ability to differentiate these subtypes is crucial for accurate diagnosis, treatment planning, and epidemiological studies, as different subtypes appear to have varying implications for disease progression and patient outcomes.

Preliminary analytical data from our studies have demonstrated that the assay exhibits **high sensitivity, accuracy, and precision** and clinical relevance of this assay has been demonstrated. Our findings were presented as a poster at the NRL Workshop 2024.

Given the promising results and the growing need for effective diagnostic tools for HTLV, it is in our aim to advance this work toward the development of a **Class 4 In Vitro Diagnostic (IVD) device.**

LONGITUDINAL STUDY ON HTLV-1 IN ABORIGINAL COMMUNITIES

The NRL R&D and Testing teams, in collaboration with the Baker and Kirby Institutes and other partners, have successfully completed HTLV-1 Testing to support a **comprehensive 5-year longitudinal study** focused on HTLV testing in the Aboriginal community. This extensive research involved rigorous data collection and analysis aimed at understanding the prevalence of HTLV within the aboriginal communities in Central Australia.

The preliminary test results were presented at the **IUSTI 2024** conference, highlighting key findings of up to **40% HTLV-1 prevalence** in some Aboriginal communities.

In response to these findings, the NRL is committed to enhancing HTLV testing services in Australia. We are working in collaboration with the National Aboriginal Community Controlled Health Organization **(NACCHO),** Australasian Society for HIV Medicine **(ASHM)** and the Department of Health Aged Care **(DOHAC)** to support the development of national HTLV-1 clinical guidelines for use in primary health care services in Central Australia. We are also actively working WHO and members of the International Retrovirology Association **(IRVA)** to harmonise testing guidelines globally and improve the quality and accessibility of HTLV testing in Low to Middle Income Countries (LMICs).

ADVANCING ACCESSIBILITY WITH PLASMA SEPARATION CARDS (PSCs)

Following our collaboration with Roche Australia, the R&D team has demonstrated that the **plasma separation cards (PSCs) can effectively obtain nucleic acid and antibody eluates** required for the HTLV-1 proviral load (PVL) assay and commercial serological screening assays.

This innovative sampling method provides all necessary specimen types for comprehensive HTLV testing. The stability of nucleic acids on the PSCs enhances the accessibility of these tests for individuals in regional and remote settings. This work was presented at the ACMD Research Week 2024 and serves as a cornerstone for our involvement in the **Pakistan 5H Virus study,** which aims to assess HTLV prevalence in Pakistan. Currently, the prevalence of HTLV in general and high-risk populations in Pakistan is unknown. A successful demonstration of this novel application of PSCs for HTLV testing will improve access to testing both in Pakistan and globally, while also providing a preliminary assessment of the HTLV burden in high-risk populations.

Participant recruitment was expected to commence in late 2024, with NRL expecting to receive the first batch of PSC cards in the **1st half of 2025.** The NRL team is excited to be involved in this important study and looks forward to sharing the results in due course.

COLLABORATIONS ON CUTTING-EDGE DIAGNOSTIC ASSAYS

The R&D team continues to support diagnostic innovation, collaborating with international manufacturers to test new assays for approval in various jurisdictions.

Key focus areas include **Point-of-Care (PoC) Hepatitis C Virus (HCV) testing and advanced Syphilis assays**. Together with the NRL Evaluations Team, the NRL hopes to expand this service beyond infectious diseases and provide valuable support to a range of commercial companies seeking reliable and effective testing solutions.

LEARN MORE

STATS

Virtual Workshops held

8

In-person Workshops held

4

Mentoring sessions held

22

Supported Organisations

73

Trainees supported per project

373

Capacity assessments conducted

11

" By delivering relevant training workshops and subsequent one-on-one mentoring sessions, NRL fosters the development of long-term professional relationships, based on trust and respect. "

LEARN MORE

Consulting & Training: Global Empowerment

Customised and sustainable programs to enhance quality of infectious disease testing through education, advocacy and mentorship

IMPACT

WHO Projects

As a WHO Collaborating Centre for Diagnostics & Laboratory Support for HIV/AIDS and other blood-borne infections, NRL has continued its support for WHO and member states. In May 2024, NRL hosted a webinar in partnership with the WHO South-east Asian Regional Office (SEARO) and Western Pacific Regional Office (WPRO), featuring contributions from experts from the Global Fund to Fight AIDS, Tuberculosis and Malaria, and the Indian Council of Medical Research. Aimed at laboratories and testing sites, Ministries of Health, funding organisations and implementing partners, the webinar discussed how countries could implement quality assurance and quality management practices to improve infectious disease testing.

NRL supported WHO WPRO with a gap analysis of access to laboratory services at the primary healthcare level in WPRO. Through a series of virtual interviews, NRL gathered information around best practices and challenges to accessing primary healthcare from eight countries across the region, with the aim of sharing the findings in a publication. This will support commitments made by WHO Member States through the endorsement of the Regional Framework for Reaching the Unreached in the Western Pacific (2022–2030), by enabling all concerned countries to learn from the findings.

In addition, with support from WHO SEARO, NRL developed a capacity building program to train and mentor 17 selected institutes in India to become providers of serology and molecular biology External Quality Assurance Schemes (EQAS). Initiated at the request of the Indian Council of Medical Research (ICMR), NRL visited Pune, India to deliver practical, on-site training through a workshop focused on the preparation of serology and molecular EQAS panels. This was followed by a series of virtual sessions where NRL mentored the trainees through various stages of progress of their pilot EQAS programs. The trainees have made very good progress and three institutes in Puducherry, Aurangabad and Bangalore have implemented their first pilot EQAS to 10, 5 and 7 sites, respectively. This means that twenty-two Indian laboratories had the opportunity for the quality of their test results to be monitored for effectiveness.

AIHSP

NRL embarked on a project with the Indonesia Health Security Partnership (AIHSP) and funded by the Department of Foreign Affairs and Trade (DFAT), targeted at strengthening capacity at Puskesmas or primary health laboratories (Tier 1), district or city public health laboratories (Tier 2), and provincial public health laboratories (Tier 3), in the following five provinces in Indonesia: Central Java, Yogyakarta, Bali, South Sulawesi and East Nusa Tenggara (NTT). As the principal Australian implementing partner, NRL collaborated with the Indonesia One Health University Network (INDOHUN) to provide laboratory quality management systems and biosafety and biosecurity training and mentoring to selected Quality Champions at each participating laboratory. The technical assistance program focused on Tiers 1 to 3 laboratories, as these do not receive as much international support compared to reference laboratories (Tiers 4 and 5), thus supporting the Indonesian Ministry of Health's efforts to strengthen the public health laboratory system at the primary healthcare level, and enhance the quality of laboratory-based disease surveillance in Indonesia.

The program ran over 10 months and the following key activities were conducted:

- Three training workshops (two face-to-face and one virtual)
- Fifteen virtual mentoring sessions
- Three training needs capacity assessment visits to three selected laboratories in two Provinces
- Six training effectiveness assessment visits to six selected laboratories in two Provinces
- Training workshops and mentoring sessions attended by 54 participants (70% Female and 30% Male – a ratio that reflects the gender distribution of Indonesian health sector workforce).

Other projects undertaken by the Scientific Consulting and Training Team include:

In partnership with the Merieux Foundation and the Fleming Fund, NRL supported the National Center for Laboratory and Epidemiology (NCLE), Lao PDR, by performing a gap assessment of the bacteriology laboratory's processes and procedures against ISO 15189. By establishing NCLE's readiness to apply for ISO 15189 accreditation for their QMS and Bacteriology processes, the assessment findings informed a work-plan of activities recommended to support NCLE in their journey towards attaining ISO 15189 accreditation.

NRL supported a country in the Pacific to improve the quality and reliability of laboratory testing at both diagnostic and public health laboratories, by providing virtual as well as in-person training and mentoring to strengthen the quality assurance processes and capabilities of the national reference laboratory.

As part of a wider Global Fund-supported project to enable the improvement of quality systems and quality assurance for HIV, TB and malaria testing in the Democratic Republic of Congo (DRC), NRL assessed the capacity of the National Reference Laboratory for AIDS & STIs (LNRS) in Kinshasa, DRC , to expand its current production of EQA/PT programs that are provided to laboratories in surrounding regions within the DRC. The assessment findings have informed a work-plan for further capacity building.

SVI Biobank: Trusted Research Storage

The SVI Biobank is an extensive human biospecimen repository offering validated sample processing services to researchers. Managed by, and housed at NRL's primary laboratory facility, the Biobank was **founded in 2015** to provide a sample storage and processing solution for clinical researchers across the St Vincent's Hospital Melbourne (SVHM) campus and the Fitzroy / East Melbourne precinct. The SVI Biobank has maintained consistent growth throughout 2023-24 with **3 new studies** recruited over the past 12 months. Approximately **70%** of the studies we support arise from the SVHM campus. We also assist with sample processing and storage for multi-site clinical trials, and provide a sample storage-only service as required. Our Biobank Steering and Advisory Committee has representation from a range of stakeholders including SVI and NRL governance, SVHM Ethics and Research, University of Melbourne, and clinicians and other researchers.

HIGHLIGHTS

New study: VIBER-M clinical trial

In mid-2023, Biobank commenced **collection of Bone Marrow samples for the first time.** These samples are collected, alongside matched bloods, as part of the VIBER-M clinical trial on Multiple Myeloma. The trial is being run by the SVHM Department of Clinical Haematology, and includes samples collected at multiple sites across Victoria and NSW (to date), which are delivered to Biobank for processing and storage.

LEARN MORE

New study: Addiction Medicine sample collections

In collaboration with the St Vincent's Hospital Department of Addiction Medicine, Biobank began collecting samples for establishment of a **biospecimen collection for alcohol and other drug dependence disorders in early-2024.** Biobanking occurs as an add-on to treatment for patients who have provided informed consent, with the ultimate aim of building a strong resource of biological specimens to facilitate research at a later date.

Membership of MACH, ABNA, ISBER.

Biobank has expanded its networks and interactions with other Biobankers. We are members of the Melbourne Academic Centre for Health **(MACH)** biobank registry, the Australasian Biobank Network Association **(ABNA),** and the International Society for Biological and Environmental Repositories **(ISBER).**

Towards NATA accreditation – ISO 20387

Biobank maintains a strong focus on quality and as such, we are working towards attaining accreditation by NATA to the new quality standard for Biobanking - **ISO 20387.** In June 2024, NATA auditors visited the Biobank and conducted an advisory assessment of our readiness for accreditation. Their feedback was very positive and supportive of our goal to achieve accreditation in late 2024.

Quality Assurance programs

We participate in an independent proficiency testing program run by the ImmunoVirology Research Network **(IVRN)** up to three times a year, and were consistently **certified for competence in PBMC processing** by this group. Our commitment to quality is inherent in our purpose.

RESEARCH OUTPUTS

Biobank has been **acknowledged in the following publications**, which utilised samples collected, processed, and stored by biobank, prior to their retrieval for use in these research projects.

Tsao, S.C.H., Zhang, W., Nao, C.H.L., Jabson, J., Wongtrakul-Kish, K., Inglis, D. and Wang, Y., 2023. Monitoring of breast cancer treatment response by analysis of breast cancer-derived extracellular vesicles. Breast, 68, p.242.

Hassanzadeh Barforoushi, A., Tsao, S.C.H., Nadalini, A., Inglis, D.W. and Wang, Y., 2024. Rapid Isolation and Detection of Breast Cancer Circulating Tumor Cells Using Microfluidic Sequential Trapping Array. Advanced Sensor Research, p.2300206.

METRICS

Samples stored

In the past year, **143 new participants were recruited to the Biobank**. Taking into account repeat visits from previously registered participants, Biobank acquired a total of **471 participant samples** over the year. From these, a total of **7,032 vials of biological specimens were stored**, consisting of the biospecimen types shown in *Figure 1.*

Samples retrieved

Over the same time period, a **record annual total of 2,426 vials** of specimens from multiple different Biobank studies were retrieved from the Biobank and sent for use in scientific research projects. An overview of these sample types is shown in *Figure 2.*

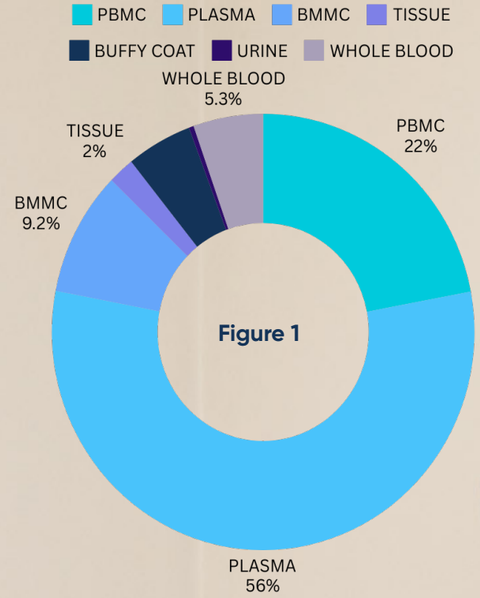


Figure 1

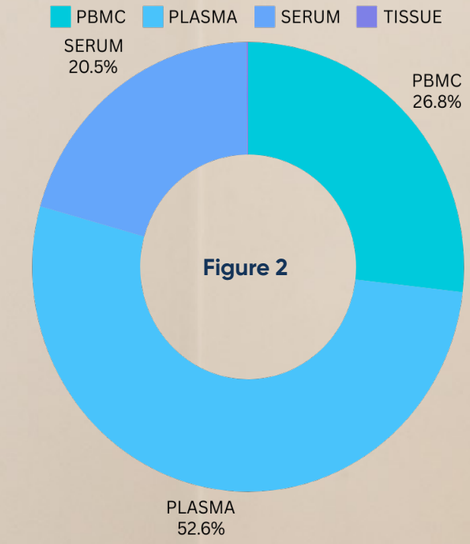


Figure 2

" We have the capacity, staff and skills to store many more sample types (such as faecal samples, nasal swabs, etc), and to work with clinical researchers to ensure all study-specific sample collection needs are met. "

STATS

Total Samples Stored

7032

Total Samples Retrived

2426

“ With access to thousands of single donor plasma specimens and a wide range of analytes, our disease mavens can create your perfect pathogen pallet.”

NRL BioSpec: Quality Biospecimens

STATS

Plasma Samples

14,000+

Established & Maintained Repository

30 Years+

In late 2023, NRL commenced a significant revamp of our plasma sample repository. Established and maintained over **30 years**, the repository consists of over 1**4,000 plasma samples** from participants infected with a range of blood-borne pathogens, including HIV, HBV, HCV, HTLV, Syphilis, alongside healthy donor plasma.

Samples are sourced primarily from national blood services and other partners within endemic areas across the globe (*Figure 1*). They are obtained under Material Transfer Agreements (MTAs) and with appropriate ethical considerations in place.

Now, NRL is proud to announce the development of this repository to provide a biospecimen service offering. NRL’s BioSpec provides testing laboratories and IVD research & developers with access to epertly curated panels of samples designed and created from the substantial plasma sample collection within our repository. Our panels afford flexibility while providing a comprehensive set of clinically characterised samples.

BioSpec has designed plug-and-play panels with testing flexibility across various use cases in mind. They can be purchased independently or combined with other sets to create a semi-customisable verification panel, catering to a wide range of testing and development needs.

The NRL BioSpec team collaborates with those groups with more unique requirements to create bespoke panels tailored to any specific quality testing and development needs; as well as providing bulk material for QA purposes.

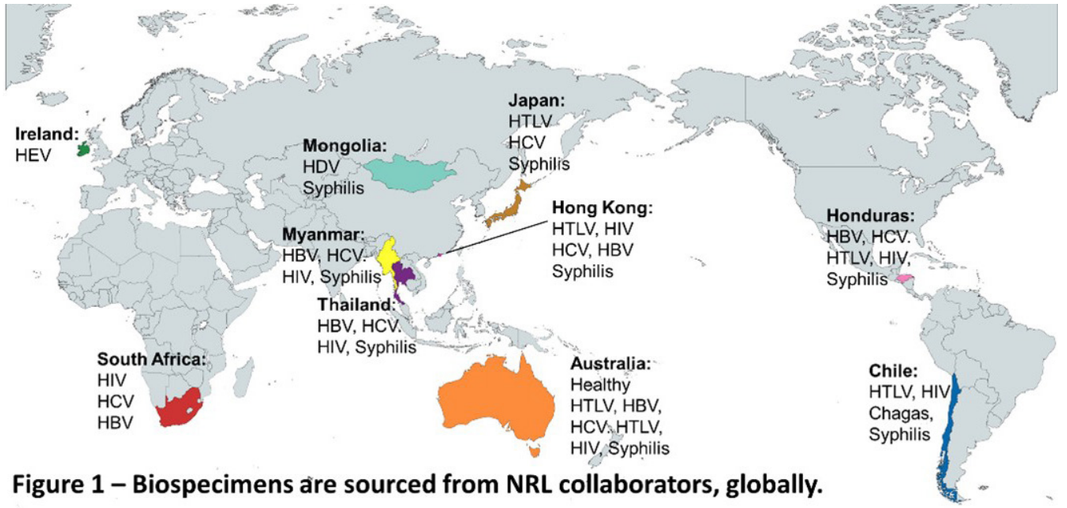
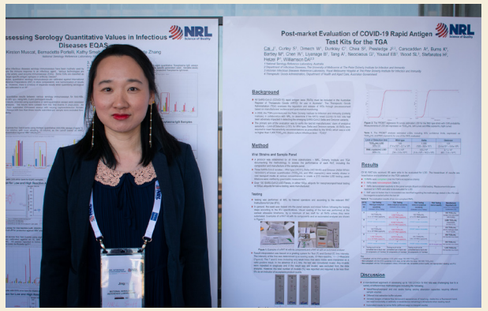


Figure 1 – Biospecimens are sourced from NRL collaborators, globally.

LEARN MORE



39th NRL Annual Workshop on Infectious Disease Testing

- The Pullman, Adelaide

DAY 1

Uncle Moogie's heartfelt Welcome to Country set a powerful tone for the day, fostering a sense of connection and shared learning. James Ward's keynote shed light on systemic health inequities, emphasising the need for Indigenous-led solutions and the potential impact of a Voice to Parliament. The session on point-of-care testing highlighted over a decade of collaboration in improving ID testing for remote Indigenous communities. Discussions on blood donor screening explored HBV prevalence, pathogen surveillance, and FIND's initiatives for global sample sharing.

DAY 2

The day focused on international health challenges, including food biosecurity, flavi-virus research, neglected tropical diseases, and gaps in public health capabilities across Southeast Asia. WHO's presentation on "Undetectable = Untransmissible" highlighted significant progress in HIV treatment and the importance of reducing stigma. The day concluded with insights into syphilis presentations, hygiene tips, serology advancements, and a QC masterclass.

DAY 3

The day addressed the challenges of the IVD development pipeline, including design, regulation, and clinical sample access, emphasising collaboration across sectors. The program concluded with a spotlight on innovative molecular research, showcasing the latest scientific advancements.

" From systemic health inequities to cutting-edge molecular research, the program highlighted Indigenous-led solutions, global health challenges, and innovations in diagnostics. "

STATS

Expectations Met

93%

Future Attendance

77%

No. of Attendees

158

No. of Sponsors

14

No. of Speakers

53

Top Rated Session

First Nations Health

Business Events Adelaide · South Australia · Government of South Australia Department of the Premier and Cabinet · DiaSorin · Roche · Abbott · Cepheid A better way. · GRIFOLS · QIAGEN · AusDiagnostics · SpeeDx · abacus dx · Genetic Signatures · BD · Diagnostic

“ From infectious disease testing to biobanking and point-of-care advancements, our publications and presentations showcase excellence in laboratory science and public health. “

Publications & Presentations: Research, Innovation and Collaboration

PUBLICATIONS

Mario Plebani*, James H. Nichols, Peter B. Luppa, Dina Greene, Laura Sciacovelli, Julie Shaw, Adil I. Khan, Paolo Carraro, Guido Freckmann, **Wayne Dimech**, Martina Zaninotto, Michael Spannagl, Jim Huggett, Gerald J. Kost, Tommaso Trenti, Andrea Padoan, Annette Thomas, Giuseppe Banfi and Giuseppe Lippi. Point-of-care testing: state-of-the art and perspectives. Clin Chem Lab Med 2024. https://doi.org/10.1515/cclm-2024-0675

Wayne Dimech, Guiseppe Vincini and Belinda McEwan. External quality control processes for infectious disease testing. Microbiology Australia Vol 45 (1), 2024. https://doi.org/10.1071/MA24013

Shephard M, Matthews S, Andrewartha K, **Dimech W, Cabuang L**, Barbara C, Chen XS, Cordioli M, Hançali A, Jiang TT, Kularatne R, Meli S, Muller E, Oumzil H, Padovese V, Sandri A, Vargas S, Zahra G, Unemo M, Blondeel K, Toskin I. Quality control and external quality assessment for the independent clinic-based evaluation of point-of-care testing to detect Chlamydia trachomatis, Neisseria gonorrhoeae and Trichomonas vaginalis in eight countries BMC Infectious Diseases volume 24, 203 (2024), https://doi.org/10.1186/s12879-024-09057-x

Wayne Dimech, Shannon Curley, Jing Jing Cai. Comprehensive, comparative evaluation of 25 automated SARS-CoV-2 serology assays. Microbiology Spectrum Vol. 12, No. 1. https://doi.org/10.1128/spectrum.03228-23. Nov 2023.

Shephard M, Matthews S, Andrewartha K, **Dimech W, Cabuang L**, Barbara C, Chen XS, Cordioli M, Hançali A, Jiang TT, Kularatne R, Meli S, Muller E, Oumzil H, Padovese V, Sandri A, Vargas S, Zahra G, Unemo M, Blondeel K, Toskin I. Quality control and external quality assessment for the independent clinic-based evaluation of point-of-care testing to detect Chlamydia trachomatis, Neisseria gonorrhoeae and Trichomonas vaginalis in eight countries BMC Infectious Diseases volume 24, 203 (2024), https://doi.org/10.1186/s12879-024-09057-x

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PRESENTATIONS

Biobank Presentation at ISBER AGM Apr 23

In 2023, the ISBER international biobanking conference was hosted at the Melbourne Convention Centre, and Biobank participated actively as a member of the Local Engagement TaskForce for this event. Dr Woods also attended the event and presented a poster.

Biobank Presentation at ABNA AGM Oct 23

Biobank was represented at the Australasian Biobank Network Association AGM in Oct 2023. Biobank co-ordinator Dr Katherine Woods attended a diverse series of talks and presented a poster on “NRLs Sample Repository”. Dr Woods won the prize for the “Elevator pitch” presentation of this poster and given that the conference was held at SeaWorld on the Gold Coast, the prize was to get up close and personal with a dolphin!

IRVA Public Health Workshop HTLV 2024 Conference

Dr. Philippa Hetzel spoke at IRVA’s Public Health Workshop and HTLV 2024 Conference in London (June 2024), presenting on HTLV testing and diagnostic practices. Representing the International HTLV Testing Working Group as Co-Chair, she addressed the global lack of sustainable molecular testing, particularly in high-endemic, low-resource regions. Following her presentation, she was requested to help establish a second Working Group focused on developing HTLV prognostic biomarkers.

OUR GLOBAL REACH

WE ACKNOWLEDGE AND THANK OUR STAKEHOLDERS

Abacus dx
Abbott Diagnostics
ABT Associates Pty Ltd
Aikenhead Centre for Medical Discovery (ACMD)
African Society for Laboratory Medicine (ASLM)
Alice Springs Hospital
American Society for Clinical Pathology (ASCP)
American Society for Microbiology (ASM)
Asian Association of Transfusion Medicine (AATM)
Association of Public Health Laboratories (APHL)
AusDiagnostics
Australasian Society for HIV, Hepatitis & Sexual Health Medicine
Australian Centre for HIV, HTLV and Hepatitis Virology Research (ACH4)
Australian Global Health Alliance
Australian Government Department of Health
Australian Government Department of Health and Ageing
Australian Indonesia Health Security Partnership (AIHSP)
Australian Institute for Medical and Clinical Scientists
Australian Network of WHO Collaborating Centres
Australian Red Cross Lifeblood
Australian WHO Collaborating Centre Network
Austin Health
Baker Institute
Becton Dickinson (BD)
BD Life Sciences Blood and Tissue Donation Services
Biomerieux
Bio-Rad Laboratories Pty Ltd
Bureau of Medical Laboratory Services (BMLS), Ministry of Health, Cambodia
Burnet Institute
Business Events Adelaide
Cepheid
Central Public Health Laboratory (CPHL), Papua New Guinea
Clinical Diagnostics division of LGC
Cordaid International
CSIRO
CSL Behring Australia
Department of Health and Human Services, Victoria
DiaMex GmbH
DiaSorin Australia Pty Ltd
Diagnostic Technology
DT Global
Flinders University International
Centre for Point-of-Care Testing
Fleming Fund
Foundation for Innovative New Diagnostics
Genetic Signatures
Global Fund
Hologic
ICAP at Columbia University
Immuno-Virology Research Network (IVRN)
Indian Council of Medical Research
Indonesia One Health University Network (INDOHUN)
Indo-Pacific Centre for Health Security
Infectious diseases testing laboratories
Integrated Quality Laboratory Services (IQLS)
Integrated Sciences
Institutions providing samples for NRL programs
International Plasma and Fractionation Association
International Retrovirology Association (IRVA)
Irish Blood Transfusion Service
IVD Manufacturers
Kirby Institute
LGC
Melbourne University
MNX Global Logistics
MP Biomedicals Australasia Pty Ltd
NACCHO - National Aboriginal Controlled Congress of Health Organisations
National Association of Testing Authorities, Australia
National Centre for Laboratory and Epidemiology (NCLE)
National Institute of Biological Standards and Controls (NIBSC)
National Measurement Institute, Australia
National Reference Laboratory/San Lazaro Hospital STD AIDS
Cooperative Central Laboratory, Philippines
New South Wales Ministry of Health
New Zealand Blood Service
Oneworld Accuracy, Canada
Ortho-Clinical Diagnostics
Pathology Technology Australia
Peter Doherty Institute for Infection and Immunity
PNG Australia Transition To Health (PATH)
PRONTO!
QIAGEN
Research Institute for Tropical Medicine, Philippines
Roche Diagnostics Australia
Royal College of Pathologists of Australasia (RCPA)
Royal Darwin Hospital
SANRU ASBL
Shanghai Blood Centre
Siemens Healthineers
SoGAT
South African National Blood Service
SpeeDx
St Vincent's Hospital Melbourne
St Vincent's Hospital Sydney
Sysmex
Thai Red Cross Society
The Mérieux Foundation (FM)
Therapeutic Goods Administration
US Centres for Disease Control and Prevention
VCS Pathology Services, Cervical Cancer Prevention Australia
Victorian Infectious Diseases Reference Laboratory (VIDRL)
Vircell
WHO Collaborating Centres
World Health Organization Headquarters and Regional Offices
World Health Organization Member States
Yayasan KNCV Indonesia


A Connected World
Needs the Best
Testing Science.
NRL
Science of Quality